

IN THE CLAIMS:

1 1. (CURRENTLY AMENDED) A method for modifying packet header data transferred
2 from a context memory internal to a forwarding engine to an output buffer of the
3 forwarding engine, the method comprising the steps of:

4 reading one or more instructions, by a processor of the forwarding engine, each
5 instruction indicating an operation to modify the packet header data;

6 generating, in response to the one or more instructions, one or more commands
7 wherein each command is associated with the operation to modify the packet header data;

8 placing the one or more commands in a data structure;

9 initiating a transfer of the packet header data from the context memory internal to
10 the forwarding engine to the output buffer of the forwarding engine; and

11 performing, by a device-data mover in the forwarding engine coupled to the
12 context memory and the output buffer and operating independently from the processor,
13 the operations associated with the one or more commands contained in the data structure,
14 to modify the packet header data as directed by the one or more commands while the
15 packet header data is being transferred from the context memory internal to the
16 forwarding engine to the output buffer of the forwarding engine.

1 2. (PREVIOUSLY PRESENTED) The method as defined in claim 1 further comprising
2 the step of:

3 acquiring the packet header data from the context memory internal to the
4 forwarding engine.

1 3. (PREVIOUSLY PRESENTED) The method as defined in claim 2 further comprising
2 the steps of:

3 generating a bit mask associated with the acquired packet header data; and

4 transferring the bit mask and the acquired packet header data to the output buffer
5 of the forwarding engine.

1 4. (PREVIOUSLY PRESENTED) The method as defined in claim 2 wherein the data
2 structure comprises one or more entries wherein each entry is associated with a command
3 and the entry contains information associated with a range of addresses and an operation
4 code that are associated with the command.

1 5. (CURRENTLY AMENDED) The method as defined in claim 4 further comprising the
2 steps of:

3 searching the data structure for an entry containing information associated with a
4 range of addresses that matches a range of addresses associated with the acquired packet
5 header data;

6 if a matching entry is found, determining if an operation code contained in the
7 matching entry indicates a delete data operation; and

8 if so, generating a delete bit mask that represents data that is deleted in the
9 acquired packet header data and transferring the delete bit mask and the acquired packet
10 header data to the output buffer of the forwarding engine.

1 6. (PREVIOUSLY PRESENTED) A method for modifying packet header data
2 transferred to an output buffer, comprising:

3 initiating, by a processor, a transfer of acquired packet header data to the output
4 buffer;

5 accessing a data structure including one or more entries containing information
6 associated with a range of addresses and an operation code; and

7 modify the acquired packet header data while the packet header data is being
8 transferred to the output buffer by,

9 searching the data structure for an entry containing information associated
10 with a range of addresses that matches a range of addresses associated with the
11 acquired packet header data,

12 if a matching entry is found, determining if an operation code contained in
13 a matching entry indicates an insert data operation, and if so,

14 a) generating a leading bit mask that represents leading data
15 contained in the acquired packet header data,

16 b) transferring the leading bit mask and the acquired packet header
17 data to the output buffer,

18 c) acquiring insert data,

19 d) generating an insert data bit mask that represents the insert data,

20 e) transferring the insert data bit mask and the insert data to the
21 output buffer,

22 f) generating a lagging bit mask that represents lagging data
23 contained in the acquired packet header data, and

24 g) transferring the lagging bit mask and the acquired packet header
25 data to the output buffer.

1 7. (PREVIOUSLY PRESENTED) The method as defined in claim 4 wherein each entry
2 contains a length and a source address associated with the command.

1 8. (PREVIOUSLY PRESENTED) The method as defined in claim 7 comprising the step
2 of:

3 searching the data structure for an entry containing information associated with a
4 range of addresses specified by the combination of the length and the source address

5 contained in the entry that matches a range of addresses associated with the acquired
6 packet header data.

1 9. (PREVIOUSLY PRESENTED) The method as defined in claim 1 wherein the data
2 structure is a table.

1 10. (PREVIOUSLY PRESENTED) The method as defined in claim 1 comprising the
2 step of:

3 clearing the data structure.

1 11-12. (CANCELLED)

1 13. (PREVIOUSLY PRESENTED) A system comprising:

2 a context memory internal to a forwarding engine configured to hold packet
3 header data;

4 a data structure configured to hold one or more commands;

5 a processor of the forwarding engine configured to read one or more instructions,
6 each instruction indicating an operation to modify the data, and in response generate one
7 or more commands to modify the data, the processor further configured to place the one
8 or more commands in the data structure;

9 an output buffer of the forwarding engine; and

10 a data mover coupled to the context memory internal to the forwarding engine and
11 the output buffer of the forwarding engine and configured to, upon initiation of a transfer
12 of the packet header data from the context memory internal to the forwarding engine to
13 the output buffer of the forwarding engine, acquire the packet header data from the
14 context memory internal to the forwarding engine, and modify the packet header data as

15 directed by the one or more commands contained in the data structure, while the packet
16 header data is being transferred from the context memory internal to the forwarding
17 engine to the output buffer of the forwarding engine.

1 14. (PREVIOUSLY PRESENTED) The system as defined in claim 13 wherein the data
2 structure is a table.

1 15. (PREVIOUSLY PRESENTED) The system as defined in claim 13 wherein the data
2 structure comprises one or more entries wherein each entry is associated with a command
3 and the entry contains information associated with a range of addresses and an operation
4 code that are associated with the command.

1 16. (PREVIOUSLY PRESENTED) The system as defined in claim 15 wherein the data
2 mover is configured to search the data structure for an entry containing information
3 associated with a range of addresses that matches a range of addresses associated with the
4 acquired packet header data and if a matching entry is found, determine if the operation
5 code contained in the matching entry indicates a delete data operation and, if so, generate
6 a delete bit mask that represents data that is deleted in the acquired packet header data.

1 | 17. (CURRENTLY AMENDED) ~~The system as defined in claim 15~~ A system
2 comprising:

3 a context memory configured to hold packet header data;

4 a data structure including one or more entries containing information associated
5 with a range of addresses and an operation code;

6 an output buffer; and

7 a data mover coupled to the context memory and the output buffer and configured
8 to, upon initiation of a transfer of packet header data from the context memory to the

9 output buffer, acquire the packet header data from the context memory, search the data
10 structure for an entry containing information associated with a range of addresses that
11 matches a range of addresses associated with the acquired packet header data and if a
12 matching entry is found, determine if the operation code contained in the matching entry
13 indicates an insert data operation and if so, (i) generate a leading bit mask that represents
14 leading data contained in the acquired packet header data, (ii) transfer the leading bit
15 mask and acquired packet header data to the output buffer, (iii) acquire insert data, (iv)
16 generate an insert data bit mask that represents the insert data, (v) transfer the insert data
17 bit mask and insert data to the output buffer, (vi) generate a lagging bit mask that
18 represents lagging data contained in the acquired packet header data, and (vii) transfer the
19 lagging bit mask and the acquired packet header data to the output buffer.

1 18. (PREVIOUSLY PRESENTED) The system as defined in claim 15 wherein each
2 entry in the data structure contains a length and a source address associated with the
3 command.

1 19. (PREVIOUSLY PRESENTED) The system as defined in claim 18 wherein the data
2 mover is configured to search the data structure for an entry containing information
3 associated with a range of addresses specified by the combination of the length and the
4 source address contained in the entry that matches a range of addresses associated with
5 the acquired packet header data.

1 20. (PREVIOUSLY PRESENTED) The system as defined in claim 13 wherein the data
2 mover is configured to generate a bit mask associated with the packet header data and
3 transfer the bit mask to the output buffer of the forwarding engine.

1 21. (PREVIOUSLY PRESENTED) The system as defined in claim 20 wherein the
2 output buffer of the forwarding engine comprises:

3 data steering logic configured to use the bit mask to identify valid data contained
4 in the transferred packet header data;

5 a working register coupled to the data steering logic and configured to hold the
6 valid packet header data transferred from the data steering logic; and

7 an output queue coupled to the working register and configured to hold the valid
8 packet header data transferred from the working register.

1 22. (PREVIOUSLY PRESENTED) An apparatus for modifying packet header data
2 transferred from a context memory internal to a forwarding engine to a output buffer of
3 the forwarding engine, the apparatus comprising:

4 means for reading one or more instructions, each instruction indicating an
5 operation to modify the packet header data;

6 means for generating, in response to the one or more instruction, one or more
7 commands wherein each command is associated with an operation to modify the packet
8 header data;

9 means for placing the one or more commands in a data structure;

10 means for holding the one or more commands and not performing the operations
11 associated with the one or more commands until initiation of a transfer of the packet
12 header data from the context memory internal to the forwarding engine to the output
13 buffer of the forwarding engine; and

14 means for performing, independent from the means for generating, the operations
15 associated with the one or more commands contained in the data structure, to modify the
16 data as directed by the one or more commands while the packet header data is being
17 transferred from the context memory internal to the forwarding engine to the output
18 buffer of the forwarding engine.

1 23. (PREVIOUSLY PRESENTED) The apparatus as defined in claim 22 comprising:

2 means for acquiring the packet header data from the context memory internal to
3 the forwarding engine.

1 24. (CURRENTLY AMENDED) The apparatus as defined in claim 23 comprising:

2 means for generating a bit mask associated with the acquired packet header data;
3 and

4 | means for transferring the bit mask and the acquired packet header data to the
5 output buffer of the forwarding engine.

1 25. (PREVIOUSLY PRESENTED) The apparatus as defined in claim 23 wherein the
2 data structure comprises one or more entries wherein each entry is associated with a
3 command and the entry contains information associated with a range of addresses and an
4 operation code that are associated with the command.

1 26. (PREVIOUSLY PRESENTED) The apparatus as defined in claim 25 comprising:

2 means for searching the data structure for an entry containing information
3 associated with a range of addresses that matches a range of addresses associated with the
4 acquired packet header data;

5 means for determining if the operation code contained in a matching entry
6 indicates a delete data operation; and

7 means for generating a delete bit mask that represents data that is deleted in the
8 acquired packet header data and transferring the delete bit mask and the acquired packet
9 header data to the output buffer, if the operation code in the matching entry indicates a
10 delete data operation.

1 27. (CURRENTLY AMENDED) An apparatus comprising:

2 means for acquiring packet header data;

3 means for accessing a data structure including one or more entries containing
4 information associated with a range of addresses and an operation code;

5 means for searching the data structure for an entry containing information
6 associated with a range of addresses that matches a range of addresses associated with the
7 acquired packet header data;

8 means for determining if the operation code contained in a matching entry
9 indicates an insert data operation; and

10 means for modify the acquired packet header data while the packet header data is
11 being transferred to an output buffer by (i) generating a leading bit mask that represents
12 leading data contained in the acquired packet header data, (ii) transferring the leading bit
13 mask and the acquired packet header data to the output buffer, (iii) acquiring insert data,
14 (iv) generating an insert data bit mask that represents the insert data, (v) transferring the
15 insert data bit mask and the insert data to the output buffer, (vi) generating a lagging bit
16 mask that represents lagging data contained in the acquired packet header data, and (vii)
17 transferring the lagging bit mask and the acquired packet header data to the output buffer,
18 if the operation code indicates an insert data operation.

1 28. (PREVIOUSLY PRESENTED) A computer readable medium comprising computer
2 executable instructions for execution in a processor for:

3 reading one or more instructions indicating an operation to modify packet header
4 data;

5 generating, in response to the one or more instructions, one or more commands
6 wherein each command is associated with the operation to modify the packet header data;

7 placing the one or more commands in a data structure;

8 holding the one or more commands and not performing the operations associated
9 with the one or more commands until initiation of a transfer of packet header data from a

10 context memory internal to a forwarding engine to an output buffer of the forwarding
11 engine; and

12 performing the operations associated with the one or more commands contained
13 in the data structure, to modify the packet header data as directed by the one or more
14 commands while the packet header data is being transferred from the context memory
15 internal to the forwarding engine to the output buffer of the forwarding engine.

1 29. (PREVIOUSLY PRESENTED) The computer readable medium as defined in claim
2 28 comprising computer executable instructions for execution in a processor for:

3 acquiring the packet header data from the context memory internal to the
4 forwarding engine.

1 30. (PREVIOUSLY PRESENTED) The computer readable medium as defined in claim
2 29 comprising computer executable instructions for execution in a processor for:

3 generating a bit mask associated with the acquired packet header data; and

4 transferring the bit mask and the acquired packet header data to the output buffer
5 of the forwarding engine.

1 31. (PREVIOUSLY PRESENTED) The computer readable medium as defined in claim
2 29 wherein the data structure comprises one or more entries wherein each entry is

3 associated with a command and contains information associated with a range of addresses
4 and an operation code that are associated with the command.

1 32. (PREVIOUSLY PRESENTED) The computer readable medium as defined in claim
2 31 comprising computer executable instructions for execution in a processor for:

3 searching the data structure for an entry containing information associated with a
4 range of addresses that matches a range of addresses associated with the acquired packet
5 header data;

6 if a matching entry is found, determining if an operation code contained in the
7 matching entry indicates a delete data operation; and

8 if so, generating a delete bit mask that represents data that is deleted in the
9 acquired packet header data and transferring the delete bit mask and the acquired packet
10 header data to the output buffer of the forwarding engine.

1 33. (PREVIOUSLY PRESENTED) The computer readable medium as defined in claim
2 31 comprising computer executable instructions for execution in a processor for:

3 initiating a transfer of the packet header data to an output buffer;

4 accessing a data structure including one or more entries containing information
5 associated with a range of addresses and an operation code; and

6 modify the packet header data while the packet header data is being transferred to
7 the output buffer by,

8 searching the data structure for an entry containing information associated
9 with a range of addresses that matches a range of addresses associated with the
10 acquired packet header data,

11 if a matching entry is found, determining if an operation code contained in
12 a matching entry indicates an insert data operation, and if so,

13 a) generating a leading bit mask that represents leading data contained in
14 the acquired packet header data,

15 b) transferring the leading bit mask and the acquired packet header data to
16 the output buffer,

17 c) acquiring insert data,

18 d) generating an insert data bit mask that represents the insert data,

- 19 e) transferring the insert data bit mask and the insert data to the output
20 buffer,
- 21 f) generating a lagging bit mask that represents lagging data contained in
22 the acquired packet header data, and
- 23 g) transferring the lagging bit mask and the acquired packet header data to
24 the output buffer.

- 1 34. (PREVIOUSLY PRESENTED) A method comprising:
- 2 reading one or more instructions, by a processor of a forwarding engine,
- 3 indicating an operation is to be performed on packet header data;
- 4 generating, in response to the one or more instructions, one or more commands
5 associated with the operation;
- 6 placing the one or more commands in a data structure;
- 7 initiating a transfer of the packet header data from a context memory internal to
8 the forwarding engine to an output buffer of the forwarding engine;
- 9 searching the data structure for an entry containing information associated with a
10 range of addresses that matches a range of addresses associated with the packet header
11 data;
- 12 determining from the entry that the operation is an insert data operation; and
- 13 performing the insert data operation, by a device operating independently from
14 the processor, by determining a leading portion of the packet header data, transferring the
15 leading portion of the packet header data to the output buffer, acquiring insert data,
16 transferring the insert data to the output buffer of the forwarding engine, determining a
17 lagging portion of the packet header data, and transferring the lagging portion of the
18 packet header data to the output buffer of the forwarding engine.